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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/875,310	06/06/2001	Toshiyuki Miyauchi	450100-03277	7066

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EXAMINER	
TORRES, JOSEPH D	
ART UNIT	**PAPER NUMBER**
2133	12

DATE MAILED: 06/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/875,310	MIYAUCHI, TOSHIYUKI	
	Examiner	Art Unit	
	Joseph D. Torres	2133	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-30 have been considered but are moot in view of the new ground(s) of rejection.

Information Disclosure Statement

2. On page 10, last paragraph of the Applicant's disclosure the Applicant introduces the document S. S. Pietrobon, "Implementation and performance of a turbo/MAP decoder, Int. J. Satellite Commun., vol. 16 pp. 23-46, January-February 1998. The Exminer is requesting a cop of the document.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-30 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 1 recites, "a linear approximation means for calculating a correction term to be added to the log likelihood, the correction term being expressed in a one-dimensional function relative to a variable; wherein said variable is an absolute value of the input data; and said linear approximation means being adapted to compute said correction term using a coefficient representing a gradient of said function for multiplying said variable, the coefficient being expressed as

a power exponent of 2". The recited language of claim 2 refers to the linear approximation of $\log(1+e^{-|P-Q|})$ on page 44 of the Applicant's disclosure, that is; an approximation of the form $-a|P-Q| - b$ on page 44 of the Applicant's disclosure. The Examiner asserts that the Mclaurin series is defined by $f(x) = \sum a_n(x-s)^n$ whereby $a_n=f^{(n)}(s)$ is the n^{th} derivative of f(x). Note: $-a|P-Q| - b = a_0 + a_1(x-s)$ when $a_1=-a$, $a_0=b$ and $x-s=|P-Q|$. If $s=-\ln(2^n/(1-2^n))$ then $a_1=-a=2^n$, since $a_1=f^{(1)}(s)=-e^{-s}/(1+e^{-s})=((2^n/(1-2^n)/(1+(2^n/(1-2^n))= 2^n$. Hence the quoted language from claim 1 is an attempt to claim the first two terms of the Mclaurin series evaluated at $s=-\ln(2^n/(1-2^n))$ and since the Mclaurin series is a natural mathematical phenomena, claim one is non-statutory. Claim 16 recites similar language.

Claims 2-15 and 17-30 depend from respective claims 1 and 16.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 4, 5, 7-16 19, 20 and 22-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over XP-000888685 ("Simplified Log-Map Algorithm", Research Disclosure, Kenneth Mason Publications, Hampshire, GB, No. 421, May 1999, Page 612, ISSN: 0374-4353) in view of Benedetto et al. (S. Benedetto, D. Divsalar, G. Montorsi, and F. Pollara, Soft-Output Decoding Algorithms in Iterative Decoding of Turbo Codes, TDA Progress Report 42-124, NASA Code 315-91-20-20-53).

35 U.S.C. 103(a) rejection of claims 1 and 16.

The XP-000888685 reference teaches a linear approximation means for calculating a correction term to be added to the log likelihood (A-|x-y|/B of Equation 6 in the XP-000888685 reference is a linear approximation means for calculating the correction term $\log(1 + e^{-|x-y|})$ for log-likelihood ratios in Equation 4, i.e., to be added to the log likelihood ratios), the correction term being expressed in a one-dimensional function relative to a variable (A-|x-y|/B of Equation 6 in the XP-000888685 reference is a one-dimensional function relative to a variable |x-y|); wherein said variable is an absolute value of the input data (|x-y| is an absolute value if the input data x and y); and said linear approximation means being adapted to compute said correction term using a coefficient representing a gradient of said function for multiplying said variable (A-|x-y|/B of Equation 6 in the XP-000888685 reference is the first two terms in a Mclaurin series expansion of the equation $\log(1 + e^{-|x-y|}) = \sum a_n(x-s)$, whereby $1/B = a_1 = f^{(1)}(s)$ is a

gradient), the coefficient being expressed as a power exponent of 2 ($1/B = 2^{-2}$). However the XP-000888685 reference does not explicitly teach the specific use of decoder.

Benedetto, in an analogous art, teaches a decoder using Log-likelihood terms with linear corrections (the Abstract, Appendix and Figures 6, A-1 and a-2 in Benedetto teach a decoder for determining the log likelihood logarithmically expressing the probability of passing a given state on the basis of the received value regarded as soft-input and decoding the input by using the log likelihood). Note: the XP-000888685 reference teaches a means for calculating log likelihood terms for use in a decoder implementing log-MAP decoding algorithms and Benedetto teaches a decoder using Log-likelihood terms with linear corrections implementing a log-MAP decoding algorithm, hence one of ordinary skill in the art at the time the invention was made would have been highly motivated to combine the XP-000888685 reference with the Benedetto paper to reduce the complexity for calculating the correction term by using linear approximations.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the XP-000888685 reference with the teachings of the Benedetto paper by including the means for calculating log likelihood terms taught in the XP-000888685 reference in a log-MAP decoder. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that the means for calculating log likelihood terms taught in the XP-000888685 reference in a log-MAP decoder would

have provided the opportunity to reduce the complexity for calculating the correction term by using linear approximations.

35 U.S.C. 103(a) rejection of claims 4, 5, 19 and 20.

Selection of a particular value for b in the equation, -ax+b, is a particular embodiment of the equation, hence does not deviate from the scope or intent of the teachings in the Benedetto paper.

35 U.S.C. 103(a) rejection of claims 7 and 22.

$|x-y|$ in the equation $A - (|x-y|/B)$ of Document XP-000888685 is a positive value, hence Document XP-000888685 teaches said correction term shows a positive value. Note also, this is consistent with the Benedetto paper since the Benedetto paper requires $x > 0$.

35 U.S.C. 103(a) rejection of claims 8 and 23.

Document XP-000888685 teaches $(A - (|x-y|/B))_+ = A - (|x-y|/B)$ when $A - (|x-y|/B) > 0$ and $(A - (|x-y|/B))_+ = 0$ when $A - (|x-y|/B) \leq 0$.

35 U.S.C. 103(a) rejection of claims 9 and 24.

The log-BCJR MAP algorithm is based on the natural logarithm (see Approximation 1 on page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 10, 11, 25 and 26.

Benedetto teaches a first probability computing means for computing for each received value a first log likelihood logarithmically expressing a first probability determined by the code output pattern and said received value (log-BCJR 1 Decoder in Figure 6 on page 79 of Benedetto is a first probability computing means for computing for each received value a first log likelihood logarithmically expressing a first probability determined by the code output pattern and said received value); a second probability computing means for computing for each received value a second log likelihood logarithmically expressing a second probability of getting to each state from the coding starting state in the time series (log-BCJR 2 Decoder in Figure 6 on page 79 of Benedetto is a second probability computing means for computing for each received value a second log likelihood logarithmically expressing a second probability of getting to each state from the coding starting state in the time series); a third probability computing means for computing for each received value a third log likelihood logarithmically expressing a third probability of getting to each state from the coding terminating state in the inverted time series (log-BCJR 3 Decoder in Figure 6 on page 79 of Benedetto is a third probability computing means for computing for each received value a third log likelihood logarithmically expressing a third probability of getting to each state from the coding terminating state in the inverted time series); and said second probability computing means and said third probability computing means having the linear approximation means (see Approximation 1 on page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 12 and 27.

The log-BCJR MAP algorithm is based on the natural logarithm (see Approximation 1 on page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 13 and 28.

The equation, -ax+b, on page 86 of Benedetto is a computation means for replacing the multiplications for computing the probability by logarithmic additions and the additions for computing the probability by logarithmic maximum value computations and computations of said function.

35 U.S.C. 103(a) rejection of claims 14 and 29.

The maximum a posteriori probability decoding operation in Benedetto is conducted on the basis of the Log-BCJR algorithm (see Approximation 1 on page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 15 and 30.

Figure 1 on page 64 of Benedetto teaches convolutional codes.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (703) 308-7066. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Joseph D. Torres, PhD
Art Unit 2133